

Remarks

Examiner Pham is thanked for the thorough Advisory Action and Final Office Action.

In the Claims

For the purposes of the instant Response Applicant has assumed that the Response filed 05 July 2006 in response to the 04 April 2006 Final Office Action was not entered.

Independent claims 1, 24 and 46 have been amended to: (1) replace "lead-free" with -- high-melting point non-solder -- before portion at lines 4 and 5; (2) delete "a coextensive" with -- an -- before "upper solder material"; and (3) adding the phrase -- wherein the lower high-melting-point non-solder portion does not melt during a reflow process to form the one or more pillar structures -- at the end of line 6.

Dependent claims 16, 38 and 61 depend from respective independent claims 1, 24 and 46 and have each been amended to replace "lead-free" with -- high-melting-point non-solder -- at line one (1).

Dependent claims 69, 70 and 71 depend from respective independent claims 1, 24 and 46 and have each been amended to replace "lead-free" with -- high-melting-point non-solder -- at line one (1).

None of these amendments have introduced new matter. The deletion of "a coextensive" has not narrowed the scope of the respective claims.

Claim Rejections

The Rejection Of Claims 1, 46, 69 And 71 Under 35 U.S.C. §102(b) As Being Anticipated By Kondoh et al. (U.S. Patent No. 5,448,114)

The rejection of claims 1, 46, 69 and 71 under 35 U.S.C. §102(b) as anticipated by Kondoh et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) is acknowledged.

The Rejection Of Claims 2, 9, 11 To 13, 19, 24, 31, 33 To 35, 41, 47, 54, 56 To 58, 64 And 70 Under 35 U.S.C. §103(a) as Being Unpatentable Over Kondoh et al. (U.S. Patent No. 5,448,114) As Applied To Claims 1, 46, 69 And 71 Above, And Further In View Of The Following Reasons.

The rejection of claims 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 47, 54, 56 to 58, 64 and 70 under 35 U.S.C. §103(a) as being unpatentable over Kondoh et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) as applied to claims 1, 49, 69 and 71 above, and further in view of the following reasons is acknowledged.

The Rejection Of Claims 3 To 8, 10, 16, 20 To 23, 25 To 30, 32, 38, 42 To 45, 48 To 53, 55, 61 And 65 To 68 Under 35 U.S.C. §103(a) as Being Unpatentable Over Kondoh et al. (U.S. Patent No. 5,448,114) As Applied To Claims 1, 2, 9, 11 To 13, 19, 24, 31, 33 To 35, 41, 46, 47, 54, 56 To 58, 64 And 69 To 71 Above, And Further In View Of Lee et al. (U.S. Patent No. 6,642,136 B1 And The Following Reasons.

The rejection of claims 3 to 8, 10, 16, 20 to 23, 25 to 30, 32, 38, 42 to 45, 48 to 53, 55, 61 and 65 To 68 under 35 U.S.C. §103(a) as being unpatentable over Kondoh et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) as applied to claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46, 47, 54, 56 to 58, 64 and 69 to 71 above, and further in view of Lee et al. (U.S. Patent No. 6,642,136 B1 (the '136 Lee Patent) and the following reasons is acknowledged.

Applicants' wish to briefly point up the claimed features of their invention which are believed to be not shown nor obvious from the teachings of known references in this field. The claims (including independent claim 26) (using independent claim 1 as a template) all clearly define a die comprising: (1) a substrate; and (2) one or

more pillar structures formed over the substrate in a pattern; at least one of the one or more pillar structures are bi-layer having a lower high-melting-point non-solder portion and an upper solder material portion; wherein the lower high-melting-point non-solder portion does not melt during a reflow process to form the one or more pillar structures.

It is noted that “pillar structures” are within the meaning of the disclosure of the instant specification and Figures, i.e. “pillar structure(s) 34”.

Claims 1, 46, 69 and 71 have been rejected under §102(b) as being anticipated by Kondoh.

According to the section 2131 of the MPEP “A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” Verdegaal Bros. vs. Union Oil Co. of California, 814 F. 2d 628, 631 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)

The '114 Kondoh Patent discloses a wall member 3 and bump 4. However, they are not the “pillar structure” as defined in the instant specification. As disclosed by Kondoh the wall member 3 and the bump 4 are each made of solder (“a wall member 3 made of solder”, Col. 9, line 10; and “when a solder bump 4 is reflowed naturally”, Col. 10, line 59). Therefore both wall member 3 and bump 4 will melt and

reflow in the “reflow process to form the one or more pillar structures” (e.g., independent claim 1, line 7 of the instantly claimed invention).

Comparatively, in the instantly claimed invention (see, for example, claim 1, lines 3 to 7), the claimed “lower high-melting-point non-solder portion” is not solder and will not reflow in the process (“wherein the lower high-melting-point non-solder portion does not melt during a reflow process to form the one or more pillar structures”). This above quoted language of instant claim 1, 46, 69 and 71 therefore distinguishes over Kondoh under §102(b) as Kondoh does not disclose a non-solder lower portion that does not melt during a reflow process to form the one or more pillar structures.

Claim s 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 47, 54, 56 to 58, 64 and 70 have been rejected under §103(a) as being unpatentable over Kondoh as applied to claims 1, 49, 69 and 71.

The above analysis under the 102(b) rejection over Kondoh also applies for this 103(a) rejection (as inter alia, as noted above, independent claim 24 has been amended to include the noted claim language) and thus claims 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 47, 54, 56 to 58, 64 and 70 further distinguish over Kondoh under §103(a) as, inter alia: (1) there is no teaching or suggestion to modify Kondoh in a manner to meet these claims; (2) Kondoh is an inoperative reference as to the instantly claimed

invention vis a vis having a lower portion that does not “melt during a reflow process to form the one or more pillar structures”; and (3) the Examiner has not presented a convincing line of reasoning as to why the claimed subject matter as a whole, including its differences over the prior art, would have been obvious (see the above analysis).

Claims 3 to 8, 10, 16, 20 to 23, 25 to 30, 32, 38, 42 to 45, 48 to 53, 55, 61 and 65 To 68 have been rejected under §103(a) as being unpatentable over Kondoh as applied to claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46, 47, 54, 56 to 58, 64 and 69 to 71 and further in view the '136 Lee Patent.

Again, the above analysis under the 102(b) rejection over Kondoh also applies for this 103(a) rejection (as inter alia, as noted above, independent claim 24 has been amended to include the noted claim language) as well as the analysis under the first 103(a) rejection over Kondoh and for the following reasons.

Applicants disagree with the Examiner's analysis that “the structure and method of Lee et al. would provide the structure and method of Kondoh with ‘high-pillar solder bump that sustains a high stand-off of the complete solder bump while maintaining high bump reliability and minimizing damage caused by mismatching or thermal stress factors between the interfacing surface.” (Lee et al.'s Col. 2, lines 19-23). At Col. 4, lines 32 to 65 of Kondoh, Kondoh specifically teaches that “[i]n addition to the package problem, there is a serious reliability problem with the bumps

themselves, when face-down assembly, such as a flip-chip method, is used. Specifically, conventional bumps ... shown in Fig. 17. ... The barrier metal layer 42 is obtained by forming a chrome or titanium layer ... then further forming it [barrier metal layer 42] on a copper or nickel layer and a gold layer in sequence by evaporation or sputtering.” (emphasis added). Therefore, it would not “...have been obvious to one of ordinary skill in the art at the time of the invention to provide the lower lead-free portion of copper coated with nickel of Lee et al....” (emphasis as to the word “copper” added) Page 6, first paragraph of the 04/04/06 Final Office Action. Further, Kondoh teaches that the bumps *be made of solder material* so that “the wall member suppresses the thermal expansion of the circuit board and absorbs thermal stress instead of the bumps.” Col. 7, lines 10 to 13.

Thus it would not be obvious to one skilled in the art to combine Kondoh with Lee in the manner suggested by the Examiner at page 6 of the 04/04/2006 Final Office Action.

Therefore claims 1 to 13, 16, 19 to 35, 38, 41 to 58, 61 and 64 to 71 are submitted to be allowable over the cited references and reconsideration and allowance are respectfully solicited.


CONCLUSION

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In conclusion, reconsideration and withdrawal of the rejections are respectively requested. Allowance of all claims is requested. Issuance of the application is requested.

It is requested that the Examiner telephone Stephen G. Stanton, Esq. (#35,690) at (610) 296 - 5194 or the undersigned attorney at (845) 452 - 5863 if the Examiner has any questions or issues that may be resolved to expedite prosecution and place this Application in condition for Allowance.

Respectively submitted,



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